Original Research Article

Functional outcome of intertrochanteric fracture neck of femur treated with proximal femoral nail

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Abstract

Introduction: Intertrochanteric fractures are common in the elderly especially with the increase in the incidence of osteoporosis. Several implants have been designed for the treatment of these fractures. In this study we analyze the functional outcome of unstable inter-trochanteric fractures fixed with proximal femoral nail.**Aim:** To study the functional outcome of intertrochanteric fractures treated with proximal femoral nailing by using modified Harris Hip Score.**Materials and Methods:** A prospective study of 48 patients admitted at Govt. Medical College, Srikakulam with intertrochanteric femur fractures were treated with 34 short proximal femur nail for 31A1 and 31A2 and 14 long PFN for 31A3 during Jan 2017- Dec 2018. Patients were followed up at 4 weeks, 3 months, and 6 months and results were evaluated using Clinical assessment includes post operative walking ability, hip and knee function, fracture union time, and implant bone interaction by modified Harris Hip Score.**Results:** The study included 48 patients, 26 males and 22 females of age 35-85 years with an average of 60 years. Excellent and good results were found in 42 patients (88%). Intra- and post-operative complications were found in 8 patients (16%). **Conclusion:** Good fracture reduction is critical in the management intertrochanteric fractures with PFN. Short proximal femoral nailing is an excellent treatment option for 31A1 and 31A2, long PFN is for 31A3 type intertrochanteric fractures.

Key words: Inter trochateric fracture femur, Harris Hip score, proximal femoral nail

Introduction

Intertrochanteric fractures are common in old age group[1].These fractures are three to four times more common in elderly women, and the mechanism of injury is usually due to low energy trauma like simple fall or due to road traffic accidents. These fractures unite readily with conservative treatment, but with the risk of complications such as malunion, coxavara, medialization of shaft, and external rotation deformity resulting in shortening of limb and limp[2]. The primary goal of the treatment has to be early mobilization to avoid secondary complications.Various operative procedures with different implants have been described for the treatment of intertro-chanteric fractures. Treatment options include dynamic hip screw (extra medullary fixation), gamma nail (intra medullary fixation), and proximal femoral nail (PFN) (intra medullary fixation).The hip screw has been considered the device of choice but has been associated with complications such as collapse of the femoral neck, leading to loss of hip offset, and shortening of the leg. Although some sliding is expected, too much shortening is detrimental to hip function. With this in mind, the PFN was designed in1996which gave an advantage of minimally invasive surgery[3]. Multiple studies have shown the superior stability of intertro-chanteric fractures treated with PFN 4-6while other studies have shown higher complication rates with PFN[7-9].We report our results of using PFN in the management of intertrochanteric fractures by analyzing the factors which influence the postoperative mobility using modified Harris Hip score[10].

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Materials and methods

This study was conducted in Govt, Medical College, Srikakulam during January 2017 to December 2018, a total of

48 patients admitted with intertrochanteric femur fractures and were treated with 34 short proximal femur nail for 31A1 AND 31A2 and 14 long PFN for 31A3. The study period was for 2 years. Patients with fresh closed intertrochanteric fractures were included in the study while compound and pathological fractures were excluded. All patients were operated within 2 weeks of the occurrence of fracture. Patients were examined and investigated with radiographs of pelvis. Skin traction was applied to the affected limb in all cases. Preoperatively, radiographs were reviewed again and fractures classified according to Orthopedic Trauma Association (OTA) classification. Neck-shaft angle and medullary size were assessed. The reduction was achieved primarily by traction and internal rotation, and adduction or abduction as required. If reduction was not achieved by traction and manipulation, reduction was achieved by limited open reduction at the fracture site. Reduction was confirmed under an image intensifier.The short PFN we used had a standard configuration with a length of 250 mm, mediolateral angulation of 6° and a neck-shaft angle of 135°. The nail had a proximal diameter of 14 mm and distal diameter of 10, 11, and12. We used a proximal de-rotation screw of 6.4 mm and distal lag screw of 8 mm. Distal locking was done with self-tapping 4.9 mm cortical screws, one of which were applied in static mode and the other in dynamic mode allowing 5 mm dynamization. Long PFN we used right and left sided with suitable length. Postoperatively, the limb was elevated with a pillow. Intravenous antibiotics were given for first 48 h followed by oral antibiotics for the next 3 days. Static quadriceps exercises were started on the 4th postoperative day. Active quadriceps and hip flexion exercise were started on 6th and 7th postoperative day. Dressing was done on 2nd, 5th and 8th postoperative days. Sutures were removed on12th post operative day.Patients were advised to walk non-weight bearing with walker as soon as tolerable. Partial weight bearing was started at about 4 weeks postoperatively. Full weight bearing walking was allowed after assessing for the radiological and clinical union. The presence of callus radiologically and absence of tenderness was considered bony union. Patients were evaluated at 4 weeks, 12 weeks, and 24 weeks [Figure 1]. The patients were assessed using the Harris Hip score10 at the follow-ups.

Results

This study involved 48 cases of intertrochanteric fractures of either sex above the age of 35. All cases were treated by intramedullary fixation with a short PFN. The age distribution was from 35 to 85 years (average 60 years). The largest group of patients was from 55 to 65 years. There were 26 males (54%) and 22 females (46%) in the study.Right sided fractures were slightly more than left sided fractures accounting to 26 cases, which made for 54 % of cases and left sided fractures accounted for 22 cases making 46% of cases 40 patients (84%) sustained the fracture due to a fall and 8 patients (16%) due to road traffic accident. Most of the patients who sustained the fracture due to fall were older in age and had osteoporosis. All the fractures were classified as per OTA classification [Table 1]. Fracture pattern, 31A1 was considered stable and 31A2 and 31A3, unstable fractures. In our study, 14 patients (29%) suffered from fracture pattern 31A1, 20 patients (42%) suffered from 31A2 and 14 patients (29%) from 31A3.Average operating time was 60 min (45–90 min) after anesthesia. Closed reduction was achieved in 42 patients (88%) whereas six patients (12%) required open reduction. The average hospital stay was 14 days. It was more in patients with co-morbid conditions and complications with highest being 22 days. We encountered complications in 8 (16%) patients [Table 2].Early complications include inadequate reduction in one patient (2%), anterior thigh pain in one patient (2%), varus deformity in one patient (2%), superficial infection in two patients (4%), implant failure in two patients (4%), and z effect in one patient (2%).Other complications include shortening in one patient (2%) and malunion in one patient (2%). According to modified Harris Hip score, over all 34% of patients had excellent results, 54 % of patients had good results, 8% of patients had fair results and 4 % of patients had poor results. After comparing in various studies, it was seen that our series was comparable with most of the standard published series[10].

Table 1: Fractures classified according to Orthopaedic Trauma Association classification

Fracture pattern	**Number of patients**	Percentage
31A1 – stable	14	29
31A2 – unstable	20	42
31A3 – unstable/reverse oblique	14	29

Table 2: Complications

Complication	Number of patients	Percentage
Inadequate reduction	1	2
Anterior thigh pain	1	2
Varus deformity	1	2
Shortening	1	2
Superficial infection	2	4

Z-effect	1	2
Malunion	1	2
Total	8	16

Table 3: Results according to modified Harris Hip Score Criteria

Results	Percentage
Excellent	16 (34)
Good	26 (54)
Fair	4 (8)
Poor	2 (4)

Fig 1(a):Guide wire (b):reaming

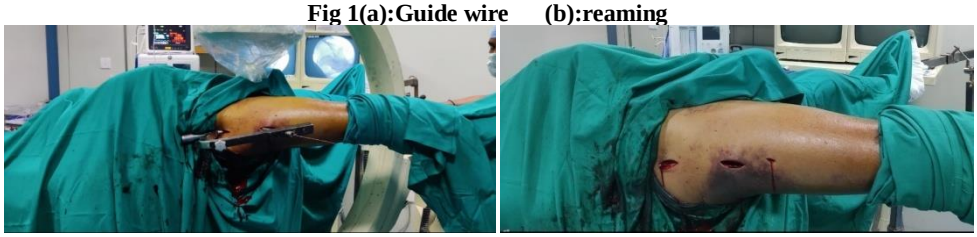

Fig 2(a):PFN jig & nail (b): incision scar

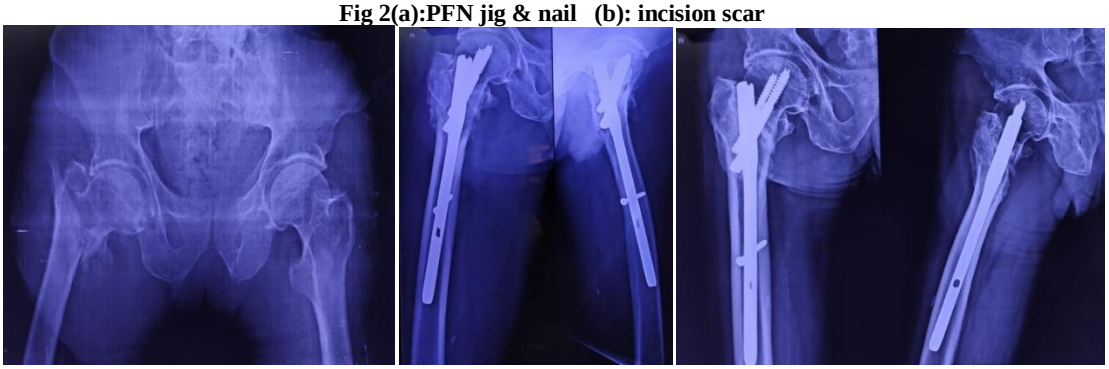

Fig 3(a):Pre op (b): post op (c): follow up

Fig 4:Clinical pic

Discussion

The successful treatment of Intertrochanteric fractures with PFN depends on many factors such as the general health of the patient, time from fracture to treatment, adequacy and stability of the fixation. Dynamic hip screw is considered the gold standard for treatment due to its favorable results and low rate of complications when used in the management of stable fractures[13] Along with the requirement of a relatively larger exposure, more tissue trauma, it has been associated with intra- and post operative varus collapse especially when used in unstable and reverse oblique fractures, ultimately leading to medialization of the shaft and deformity[14]In such cases, an intra medullary fixation with PFN can be advantageous. Intra medullary devices have been shown to be biologically stronger and can withstand higher static and several fold higher cyclical loading than dynamic hip screw[15]. A medial buttress provides adequate reduction in implant stress and fatigue.16 PFN also acts as a buttress in preventing the medialization of the shaft. Moreover, thus, the fracture heals without the primary restoration of the medial support. The implant compensates for the function of the medial column[12].The nail's position near the weight bearing axis reduces the stress generated on the implant significantly. The entry point of the PFN is at the tip of the greater trochanter, so it reduces the damage to the hip abductors unlike the gamma nail which is inserted through the pyriformis fossa and with a derotation screw reduces the chances of cutout as compared to the gamma nail[16-18] The hip screw and the anti-rotation cervical screw of the PFN adequately compress the fracture, leaving between them adequate bone block for further revision should the need arise.The most common mode of injury in our study was low energy trauma due to fall (62%) in elderly. In the young age group, fracture was due to high energy trauma. In our study, 38% were stable fracture and 62% were unstable. Stable fractures required less radiation exposure than the unstable fractures. Most patients with low energy trauma had osteoporosis. The most common grade of osteoporosis was Singh's Grade 3. Our operating time reduced gradually during the study which reflected the steep learning curve of the proximal femoral nailing.The anatomical reduction and secure fixation of the fracture on the operating table are absolutely vital for easy handling and good surgical result. In our study, 12% of patients required limited open reduction which was higher in comparison to the study by Boldin et al. (9%).[18] The entry point of the nail was taken on the tip or the lateral part of the greater trochanter. As the nail has 6° of valgus angle medial entry point causes more distraction of the fracture. The hip pin was inserted 5 mm away from the subchondral bone in the lower half in the anteroposterior (AP) view and center on the neck in the lateral view.The cervical screw should be placed parallel to the hip screw in AP view, and they should overlap in lateral view. Ideally, the cervical screw should be 10 mm shorter than the hip screw. This ensures that the cervical screw does not take the weight load but only fulfill the anti-rotational function. Failure to do this leads to "Z-effect," when the cervical pin backs out, and the hip pin pierces the joint or vice-versa. We observed this complication in one patient. The patient underwent revision surgery and the fracture healed. There was no implant breakage. There was no case of nonunion. The overall rate of complication was 22%. This is comparable to Gadegone and Salphale [11] it was slightly lower than their study. In the series of 295 patients with trochanteric fractures treated with PFN by Domingo et al.[19]the average age of the patient was 80 years, which possibly accounted for 27% of the patients developed complications in the immediate postoperative period. Although the higher price of PFN is a limiting factor as compared to dynamic hip screw, we believe that treatment of intertrochanteric fractures particularly of unstable pattern with PFN is a good and efficient treatment.

Conclusion

Regardless of the fracture type, adequate fracture reduction is critical in the management of intertrochanteric fractures. Short proximal femoral nailing is an excellent treatment option for 31A1 and 31A2, long PFN is for 31A3 type intertrochanteric fractures. Following good anatomic reduction is an efficient and minimally invasive surgical treatment with better axial telescoping and rotational stability.

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